CLAIMS

1. An auditory prosthesis system comprising:

a microphone,

a sound processor,

a current stimulator, and

at least one stimulating electrode disposed in the inferior colliculus of a mammal, the at least one stimulating electrode comprised of at least two shanks, each shank comprised of one or more stimulation sites.

2. The auditory prosthesis system of Claim 1, each shank being from 3 to 7 millimeters in length.

3. The auditory prosthesis system of Claim 1, comprised of one stimulating electrode disposed in the inferior colliculus of a mammal, the electrode having five shanks, each shank having from 10 to 80 stimulation sites.

4. The auditory prosthesis system of Claim 3, wherein the stimulation sites on each shank are linearly spaced from 50 to 400 micrometers apart.

5. The auditory prosthesis system of Claim 1, wherein each stimulation site has a surface area from 400 to 4000 square micrometers.

6. The auditory prosthesis system of Claim 1, wherein each stimulation site has a surface area of 2000 square micrometers.

7. The auditory prosthesis system of Claim 1, comprised of at least one stimulating electrode having five shanks, each shank having 20 stimulation sites, each stimulation site linearly spaced 200 micrometers apart.

8. The auditory prosthesis system of Claim 1, comprised of at least one stimulating electrode having five shanks, each shank having 40 stimulation sites, each stimulation site linearly spaced 100 micrometers apart.

9. The auditory prosthesis system of Claim 1, comprised of two or more stimulation sites configured for stimulation across and within different isofrequency laminae of the central nucleus of the inferior colliculus.

10. The auditory prosthesis system of Claim 1, comprised of two or more stimulation sites configured for stimulation at different locations within the same isofrequency lamina of the central nucleus of the inferior colliculus.

11. The auditory prosthesis system of Claim 1, wherein the system differentially extracts one or more frequency components of a sound wave and differentially stimulates one or more regions of the inferior colliculus.

12. The auditory prosthesis system of Claim 11, wherein the differential stimulation of the inferior colliculus is done by current steering.

13. The auditor prosthesis system of Claim 1, wherein the microphone comprises a directional microphone.

14. The auditor prosthesis system of Claim 1, wherein the microphone comprises an array of microphones.

15. The auditor prosthesis system of Claim 1, wherein the current stimulator comprises an induction coil for receiving a radiofrequency signal from the processor.

16. An auditory prosthesis system comprising:

a microphone,

a sound processor comprising an encoder and a transmitter,

a current stimulator that is implanted in a mammal and that comprises a receiver, and

at least one stimulating electrode disposed in the inferior colliculus of the mammal, the electrode comprised of at least two shanks, each shank comprised of one or more stimulation sites,

wherein the microphone senses sound vibrations and transmits a sound waveform to the sound processor,

the sound processor decomposes the sound waveform into a stimulation sequence signal that is transmitted to the current stimulator,

the current stimulator receives the stimulation sequence signal transmitted by the processor, decodes the signal into a differential stimulation sequence, and transmits the sequence to one or more stimulation sites on the stimulating electrode.

17. The auditory prosthesis system of Claim 16, wherein the sound processor comprises an inductive coil, the current stimulator comprises a radiofrequency receiver, and the signal transmitted by the sound processor to the current stimulator is a radiofrequency signal.

18. The auditory prosthesis system of claim 16, wherein the current stimulator is powered by transcutaneous induction from the sound processor.

19. The auditory prosthesis system of Claim 16, wherein the current stimulator and at least one stimulating electrode are connected by wire.

20. The auditory prosthesis system of Claim 16, wherein the transmission of the stimulation sequence from the current stimulator to at least one stimulating electrode occurs wirelessly.

21. The auditory prosthesis system of Claim 16, wherein the transmitter portion of the sound processor and the implanted current stimulator are held together magnetically across a biological membrane of the mammal.

22. The auditory prosthesis system of claim 16, wherein the system differentially extracts one or more frequency components from sound waves and differentially stimulates one or more regions of the inferior colliculus of the mammal.

23. The auditory prosthesis system of claim 16, wherein the processor decomposes the sound waveform by at least one of frequency coding, temporal coding, and group coding.

24. A method of inducing auditory sensation in a mammal, comprising the steps of:

providing a microphone, a sound processor, and a current stimulator;

providing one or more stimulating electrodes each comprised of two or more shanks, each shank comprised of one or more stimulation sites;

disposing at least one stimulating electrode in the inferior colliculus of a mammal; and

stimulating at least one isofrequency lamina of the inferior colliculus by applying an electrical signal through at least one of the stimulation sites.

25. The method of Claim 24, wherein the stimulating electrode is disposed by insertion perpendicular to at least one isofrequency laminae of the central nucleus of the inferior colliculus such that one or more stimulation sites are aligned along a tonotopic axis of the central nucleus.

26. The method of Claim 24, wherein the stimulating step comprises frequency coding, temporal coding, and group coding.

27. The method of Claim 24, wherein two or more stimulation sites are configured for stimulation across and within different isofrequency laminae of the central nucleus of the inferior colliculus.

28. The auditory prosthesis system of Claim 24, wherein two or more stimulation sites are configured for stimulation at different locations within the same isofrequency lamina of the central nucleus of the inferior colliculus.

29. A method of inducing auditory sensation in a mammal, comprising the steps of:

providing a microphone, a sound processor comprising an encoder and a transmitter a sound processor, and a current stimulator that is implanted in a mammal and that comprises a receiver,

providing at least one stimulating electrode, the electrode comprised of at least two shanks, each shank comprised of one or more stimulation sites,

disposing at least one stimulating electrode in the inferior colliculus of a mammal; and

differentially stimulating at least one isofrequency lamina of the inferior colliculus by applying an electrical signal through at least one of the stimulation sites,

wherein the microphone senses sound vibrations and transmits a sound waveform to the sound processor,

the sound processor decomposes the sound waveform into a stimulation sequence signal that is transmitted to the current stimulator,

the current stimulator receives the stimulation sequence signal transmitted by the processor, decodes the signal into a differential stimulation sequence, and transmits the sequence to one or more stimulation sites on the stimulating electrode.

30. The method of Claim 29, wherein the sound processor comprises an inductive coil, the current stimulator comprises a radiofrequency receiver, and the signal transmitted by the sound processor to the current stimulator is a radiofrequency signal.

31. The method of Claim 29, wherein the current stimulator is powered by transcutaneous induction from the sound processor.

32. The method of Claim 29, wherein the current stimulator and at least one stimulating electrode are connected by wire.

33. The method of Claim 29, wherein the transmission of the stimulation sequence from the current stimulator to at least one stimulating electrode occurs wirelessly.

34. The method of Claim 29, wherein the transmitter portion of the sound processor and the implanted current stimulator are held together magnetically across a biological membrane of the mammal.

35. The method of Claim 29, wherein the system differentially extracts one or more frequency components from sound waves and differentially stimulates one or more regions of the inferior colliculus of the mammal.

36. The method of Claim 29, wherein the processor decomposes the sound waveform by at least one of frequency coding, temporal coding, and group coding.

37. The method of Claim 29, wherein two or more stimulation sites are configured for stimulation across and within different isofrequency laminae of the central nucleus of the inferior colliculus.

38. The method of Claim 29, wherein two or more stimulation sites are configured for stimulation at different locations within the same isofrequency lamina of the central nucleus of the inferior colliculus.

39. An auditory prosthesis system comprising:

a microphone,

a sound processor,

a current stimulator, and

at least one stimulating electrode disposed in the inferior colliculus of a mammal, the at least one stimulating electrode comprised of at least one shank having one or more stimulation sites.

40. A method of inducing auditory sensation in a mammal, comprising the steps of:

providing a microphone, a sound processor, and a current stimulator;

providing one or more stimulating electrodes comprised of one or more shanks, each shank comprised of one or more stimulation sites;

disposing at least one stimulating electrode in the inferior colliculus of a mammal; and

stimulating at least one isofrequency lamina of the inferior colliculus by applying an electrical signal through at least one of the stimulation sites.